APPENDIX D

Construction Air Quality Management Plan

This document has been prepared on behalf of **Frasers Property Australia and Altis Property Partners** by:

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Construction Air Quality Management Plan

Addressee(s):	**Frasers Property Australia and Altis Property Partners**
Report Reference:	**20.1123.FR1V2**
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Quality Control

Study	Status	Prepared	Checked	Authorised
INTRODUCTION	Final	Northstar	GCG, MD	MD
LEGAL AND OTHER REQUIREMENTS	Final	Northstar	GCG, MD	MD
THE DEVELOPMENT	Final	Northstar	GCG, MD	MD
BASELINE DATA	Final	Northstar	GCG, MD	MD
AIR QUALITY STANDARDS	Final	Northstar	GCG, MD	MD
AIR QUALITY MANAGEMENT	Final	Northstar	GCG, MD	MD
REVIEW AND IMPROVEMENT	Final	Northstar	GCG, MD	MD

Report Status

Northstar References		Report Status	Report Reference	Version
Year	Job Number	(Draft: Final)	(R*x*)	(V*x*)
20	1123	F	R1	V2
Based upon the above, the specific reference for this version of the report is:				**20.1123.FR1V2**

Final Authority

This report must by regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below.

Martin Doyle **1st March 2021**

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Units Used in the Report

All units presented in the report follow International System of Units (SI) conventions, unless derived from references using non-SI units. In this report, units formed by the division of SI and non-SI units are expressed as a negative exponent, and do not use the solidus (/) symbol. *For example*, 50 micrograms per cubic metre would be expressed as 50 $\mu g \cdot m^{-3}$ and not 50 $\mu g/m^3$.

Common Abbreviations

Abbreviation	Term
AQIA	air quality impact assessment
AQMP	air quality management plan
AQMS	air quality monitoring station
BoM	Bureau of Meteorology
CEMP	construction environmental management plan
DEC	Department of Environment and Conservation
DPI&E	Department of Planning, Industry and Environment
EETM	emission estimation technique manual
EPA	Environmental Protection Authority
m^{-2}	per square metre
m^{-3}	per cubic metre
$mg \cdot m^{-3}$	milligram per cubic metre of air
$mg \cdot Nm^{-3}$	milligram per normalised cubic metre of air
$\mu g \cdot m^{-3}$	microgram per cubic metre of air
$month^{-1}$	per month
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 µm or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 µm or less
TSP	total suspended particulates

1. INTRODUCTION

Frasers Property Australia and Altis Property Partners have engaged Northstar Air Quality Pty Ltd (Northstar) to provide a Construction Air Quality Management Plan (CAQMP), which forms part of the Construction Environmental Management Plan (CEMP) developed for the construction of a warehouse, logistics and industrial facilities hub (the development). The development is located at 657-769 Mamre Road, Kemps Creek, NSW (the development site).

The development includes the demolition of existing structures, earthworks, construction of roads, hardstand areas and warehouses and offices (together, construction activities). This CAQMP identifies the potential sources of emissions of air pollutants associated with the proposed construction activities and provides measures to control each of those potential sources.

As part of the State Significant Development (SSD) Application, an air quality impact assessment was performed (Northstar Air Quality, 2020), which included a risk-based assessment of the potential impacts associated with construction dust. That assessment determined that with the implementation of appropriate controls, the risk of impacts associated with fugitive dust emissions from the construction of the development would be low.

The CAQMP has been performed by Northstar, a specialist air quality consultancy with extensive experience in the provision of air quality management plans. A CV for the principal author (Dr Martin Doyle) is provided as **Appendix A**).

1.1. Objectives and Targets

The key objectives of the CAQMP are to minimise emissions of air pollutants from the development site and to ensure that impacts to air quality are minimised and within the scope permitted by the Approval. To achieve these objectives, the summarised targets in **Table 1** have been proposed for the management of air quality impacts during construction.

Table 1 Proposed targets and Key Performance Indicators (KPIs) associated with the management of air quality

Measure	Target	Timeframe	Responsibility	Documentation
Visible dust emissions	Any emissions of visible dust investigated immediately. Review controls applied and increase controls or modify activities	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist

Measure	Target	Timeframe	Responsibility	Documentation
Spillage or track-out onto public roads	Any spillage or track-out on public roads to be cleaned immediately	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Maintenance of all plant and equipment used on site in a proper and efficient condition Operation of all plant and equipment used on site in a proper and efficient manner	All plant and equipment to be maintained in accordance with manufacturers specifications. All plant and equipment to be operated efficiently.	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Complaints regarding air quality	Zero complaints. Any complaints would be investigated (see Section 7.2)	At all times	Site supervisor	Complaints register
Meeting Project Approval Conditions regarding air quality	Compliance with conditions	At all times	Site supervisor	Environmental inspection checklist Construction Compliance Report

2. LEGAL AND OTHER REQUIREMENTS

Provided below are the key relevant legislation, guidelines and other relevant documentation and Project Approval Conditions, as they relate to air quality impacts during construction of the development.

2.1. Legislation

Legislation relevant to the management of air quality for the development includes:

- Environmental Planning and Assessment Act 1979 (EP&A Act);
- Protection of the Environment Operations Act, 1997 (POEO Act);
- Protection of the Environment Operations (Clean Air) Regulation 2010 (POEO (Clean Air) Regulation 2010); and,
- State Environmental Planning Policy (Western Sydney Employment Area) 2009.

2.2. Guidelines and Relevant Documents

Guidelines and other documentation relevant to the management of air quality for the development includes:

- NSW EPA Local Government Air Quality Toolkit – Air Quality Guidance Note – Construction sites;
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2016); and,
- Guidance on the assessment of dust from demolition and construction (IAQM, 2016).

2.3. Project Approval Conditions

Project Approval Conditions have been issued by the NSW Department of Planning, Industry and Environment (DPI&E) for the development. The Conditions which apply to air quality are reproduced in **Table 2**.

Table 2 Project Approval Conditions – air quality

Number	Condition	Reference
Operation of Plant and Equipment A24	All plant and equipment used on site, or to monitor the performance of the development, must be: (a) maintained in a proper and efficient condition; and (b) operated in a proper and efficient manner.	Section 6.1
Dust Minimisation B43	The Applicant must take all reasonable steps to minimise dust generated during all works authorised by this consent.	This document

Number	Condition	Reference
Construction Air Quality Management Plan B44	Prior to the commencement of construction, the Applicant must prepare a Construction Air Quality Management Plan (CAQMP) to the satisfaction of the Planning Secretary. The CAQMP must form part of the CEMP required by condition C2 and must:	This document
	(a) be prepared by a suitably qualified and experienced person(s);	Section 1
	(b) detail and rank all emissions from all construction activities, including particulate emissions;	Section 3.4 Section 3.5
	(c) describe a program that is capable of evaluating the performance of the construction and determining compliance with key performance indicators;	Section 1.1 Section 6
	(d) identify the control measures that will be implemented for each emission source, including but not limited to: (i) exposed surfaces and stockpiles are suppressed by regular watering; (ii) all trucks entering or leaving the site with loads have their loads covered; (iii) trucks associated with the development do not track dirt onto the public road network; (iv) public roads used by these trucks are kept clean; (v) land stabilisation works are carried out progressively on site to minimise exposed surfaces; and	Section 6.3
	(e) nominate the following for each of the proposed controls: (i) key performance indicator; (ii) monitoring method; (iii) location, frequency and duration of monitoring; (iv) record keeping; (v) complaints register; (vi) response procedures; and (vii) compliance monitoring.	Section 6.1
Management Plan Requirements C1	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	-
	(a) detailed baseline data;	Section 4
	(b) details of: (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	Section 2 Section 5 Section 6.1

Number	Condition	Reference
	(c) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	Section 6.3
	(d) a program to monitor and report on the: (i) impacts and environmental performance of the development; and (ii) effectiveness of the management measures set out pursuant to paragraph (c) above;	Section 6 Section 7
	(e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	Section 6.4
	(f) a program to investigate and implement ways to improve the environmental performance of the development over time;	Section 7
	(g) a protocol for managing and reporting any: (i) incident and any non-compliance (specifically including any exceedance of the impact assessment criteria and performance criteria); (ii) complaint; (iii) failure to comply with statutory requirements; and	Section 7
	(h) a protocol for periodic review of the plan.	Section 7

3. THE DEVELOPMENT

The following provides a description of the context, location, and scale of the development, provides a description of the processes and phasing of the development activities on site. It also identifies the potential for emissions to air associated with the development.

3.1. Environmental Setting

The development site is located at 657-769 Mamre Road, Kemps Creek, NSW. A map showing the location of the development site is provided in **Figure 1** below.

Figure 1 Development site location

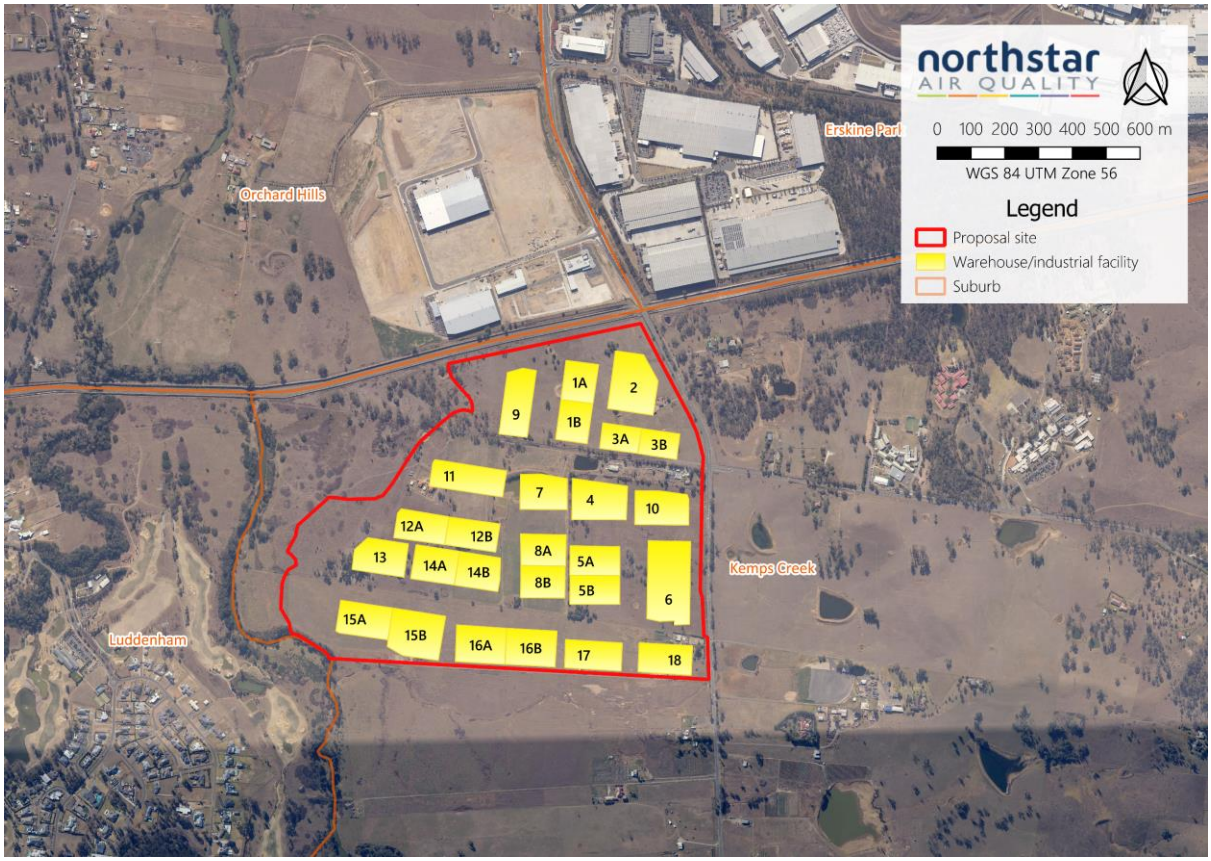


Image courtesy of Google Maps

The closest residential property is approximately 110 metres (m) from the development site boundary to the south, with the closest major residential area 1.8 kilometres (km) to the north of the development site.

3.2. Description of Development

The development comprises the construction of a number of warehouse buildings over eight lots as the first stage of development, with estate works across the broader site comprising bulk earthworks to create building pads for future development, stormwater infrastructure and an internal road network including a north south distributor road connecting to the adjacent property, intersection upgrades and the widening of Mamre Road.

Specifically, SSD 9522 permits the following development:

- Demolition of existing structures, site-wide earthworks, landscaping, stormwater and other infrastructure and an internal road network;
- Construction and operation of eight warehouses comprising 162 355 m^2 of floor space;
- Intersection upgrade works in Mamre Road;
- 744 parking spaces; and
- 21-lot Torrens title subdivision over two stages, being Stage 1 residual lot subdivision (5 lots) and Stage 2 residual and development lot subdivision (17 lots).

The Stage 1 development of the development comprises the subdivision of five lots within the site, along with demolition and site wide earthworks, landscaping, utilities, stormwater and the internal road networks. Stage 1 also includes the construction and operation of eight warehouses inclusive of 744 parking spaces and intersection upgrade works on Mamre Road.

The Stage 2 development comprises the subdivision of the remaining portion of the site into a further 17 lots.

Development on these lots is then anticipated to occur over a period of time to meet market demand and would be subject to future development applications.

3.3. Hours of Construction

Construction is permitted between the hours of 7.00am and 6.00pm, Monday to Friday, and 8.00am to 1.00pm on Saturdays. No construction activities will be performed on Sundays, or on public holidays.

3.4. Identification of Potential Emissions to Atmosphere

The activities to be performed during the construction of the development which may have the potential to impact upon air quality include:

- demolition of existing structures within the development site;
- earthworks including stripping and stockpiling of topsoil, and cut and fill;
- importation of fill from offsite;
- movement of plant and equipment on the site and heavy vehicles on unpaved areas; and,
- construction of hardstand areas, roads, and warehouses and offices.

The activities above would result in emissions of particulate matter (dust) and gaseous emissions through the combustion of fuel in vehicles, plant and machinery.

Of the activities outlined above, emissions associated with earthworks and the movement of heavy vehicles on unpaved areas have the greatest potential to impact on local air quality, and it is these activities which are examined in detail in this CAQMP. However, the controls outlined in this CAQMP consider all sources of emissions (refer **Section 6.3**).

The risk of dust impacts from a demolition/construction site causing loss of amenity and/or health or ecological impacts is related to the following (IAQM, 2014):

- The nature of the activities being undertaken;
- The duration of the activities;
- The size of the site;
- The meteorological conditions (wind speed, direction, rainfall). Adverse impacts are more likely to occur downwind of the site and during drier periods;
- Soil moisture content and soil type and erodibility;
- The proximity of receptors to the activities;
- The sensitivity of the receptors to dust; and
- The adequacy of the mitigation measures applied to reduce or eliminate dust.

In addition, the risk of air quality impacts arising from exhaust emissions are related to the following:

- The number and type of plant and equipment being used;
- The duration of use of each item of plant and equipment;
- Appropriate operation and maintenance of plant and equipment; and
- Compliance of plant and equipment with relevant emission standards.

The development will be constructed in three stages, with the following activities being performed in all stages:

- slash, clear and grub site (including demolition of existing structures);
- strip topsoil and stockpile;
- importing and compacting of any required fill material.

In Stage 1, the additional activity of cut and fill will also be performed. The anticipated areas, quantities and durations of activities performed during each stage are presented in **Table 3**. The aggregated stage duration is also provided, and it is noted that these may not equate to a simple addition of the duration of each activity due to overlapping and/or non-sequential activities in each stage.

Table 3 Anticipated areas and quantities associated with activities

Description	Area/volume	Anticipated duration
Stage 1 (total area 592 045 m^2, anticipated total duration 336 days, including the following		

Description	Area/volume	Anticipated duration
Slash, clear and grub site	592 045 m^2	59 days
Strip topsoil and stockpile	118 409 m^3	40 days
Cut to fill	36 200 m^3	12 days
Import and compact fill	1 114 620 m^3	21 days
Stage 2 (total area 167 000 m^2 anticipated total duration 114 days, including the following		
Slash, clear and grub site	167 000 m^2	15 days
Strip topsoil and stockpile	33 400 m^3	11 days
Import and compact fill	330 000 m^3	95 days
Stage 3 (total area 167 000 m^2 anticipated total duration 122 days, including the following		
Slash, clear and grub site	167 000 m^2	15 days
Strip topsoil and stockpile	33 400 m^3	11 days
Import and compact fill	325 000 m^3	92 days

A number of ancillary activities such as construction of retaining walls, laying of asphalt, electrical installation, landscaping and construction of warehouses and offices will also take place, although the earthworks activities outlined in **Table 3** would result in the greatest potential for emissions to air, and it is these activities which have been examined in detail.

It is also noted that areas where works have been completed, but where stabilisation is yet to be finalised, will also result in potential for particulate emissions. The quantification of emissions (refer **Section 3.5**) has conservatively assumed that all areas of the site in each stage are exposed at any one time.

The plant and equipment to be used during the construction of the development will include:

- 627 Scraper ×8
- Compactor ×6
- Water cart ×3
- Grader ×2
- Roller ×2
- Intermittent – Dozer, Backhoe, excavator, Dump truck

It is anticipated that up to 200 trucks would be involved in importing fill to the site, with these trucks being predominately 'truck and dog' configuration.

3.5. Quantification of Potential Emissions to Atmosphere

As required by the Project Approval Conditions, this CAQMP provides a quantification of emissions associated with construction activities and identifies the emission control measures which would be applied to each source.

Emissions have been estimated adopting activity data as outlined in **Table 3**, and emission factors for materials handling processes, movement of trucks on unpaved site roads, and wind erosion contained within the US EPA AP-42 emission factor compendium (US EPA, 1995 and updates). These factors are appropriate for adoption in Australia and are routinely adopted in the assessment of operations of a similar nature.

Emissions of total suspended particulate (TSP), particulate matter with an aerodynamic diameter of <10 microns (PM_{10}), and $PM_{2.5}$ have been calculated without the inclusion of controls. Emission controls have then been identified and applied to the sources of emissions to determine the likely reductions which could result through the implementation of those measures.

The proposed emission controls to be adopted during the construction of the development are outlined in **Table 4**, which include the requirement outlined in Condition B44 of the Consent conditions. Where a justifiable emission control efficiency is available in the literature (DSEWPC, 2012), these are noted and have been applied. A range of control measures are proposed, and are not limited to those for which a justifiable control efficiency is available (see **Section 6.3**).

Table 4 Proposed emissions controls

Measure	Aim	Anticipated emission control efficiency (%)
Watercarts and handheld water sprays on site to control dust regularly	Minimise dust generation on haul roads, exposed areas and during materials handling activities	50
Speed limits for vehicles on-site	Reduce the potential for wheel generated dust	-
Progressive stripping of site ahead of workface to limit the amount of exposed surface	Minimise the area of exposed surface available for wind erosion	-
Dust suppressant/hydromulching to areas where final level achieved	Minimise the area of exposed surface available for wind erosion	70
Sediment and erosion controls as per civil design and approved soil and water management plan and erosion and sediment control plan	Avoid mobilisation of silt and sediment which may be erodible by the wind	-

Measure	Aim	Anticipated emission control efficiency (%)
Street sweeping where required	Remove silt and sediment from road and hardstand surfaces which may become a source of wind-blown dust. This includes the public road network	-
Truck wash at exit	Ensure that any material on truck wheels, tyres and truck body does not track-out onto public roads	-
Trucks to have loads covered	Ensure that all trucks entering or leaving the site with loads have their loads covered	-

The following figures present the anticipated emissions during each stage of construction and associated with each broad source of emissions, before (uncontrolled) and after the application of the proposed control measures outlined in **Table 4** (controlled).

Figure 2 Particulate emissions, Stage 1 construction – uncontrolled and controlled

Figure 3 Particulate emissions, Stage 2 construction – uncontrolled and controlled

Figure 4 Particulate emissions, Stage 3 construction – uncontrolled and controlled

Figure 5 Particulate emissions, all stages – uncontrolled and controlled

Figure 6 Particulate emissions, all stages, per day – uncontrolled and controlled

Also presented are the total anticipated emissions of particulate matter (uncontrolled and controlled) during the construction of the development as a whole (i.e. all stages), and also averaged by the length of the construction period.

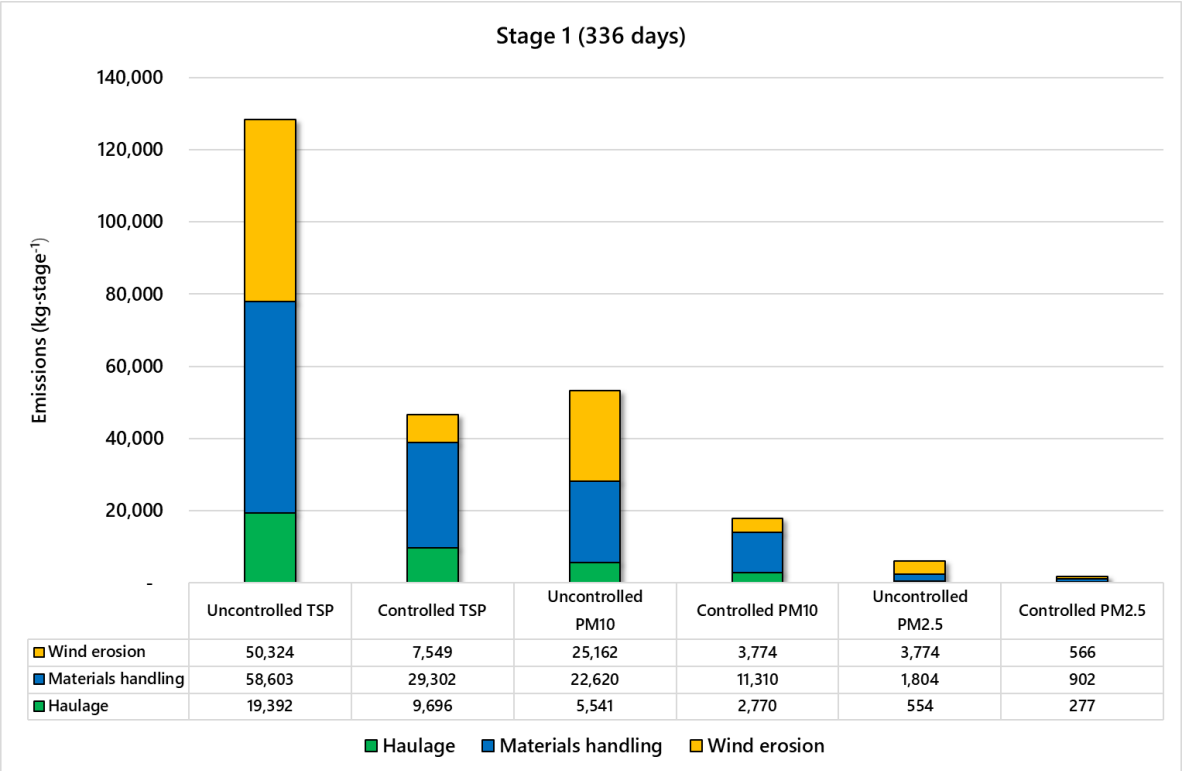
Emissions of particulate matter are dominated by wind erosion and materials handling activities, should these not be appropriately controlled. Emissions from haulage activities are shown to be greater during Stage 1 construction, although control measures will be applied to all sources throughout the duration of construction.

The application of the emission control measures results in reductions in all three particulate size fractions (i.e. TSP, PM_{10} and $PM_{2.5}$), as presented in **Table 5**.

Table 5 Potential reduction in emissions through application of proposed emissions controls

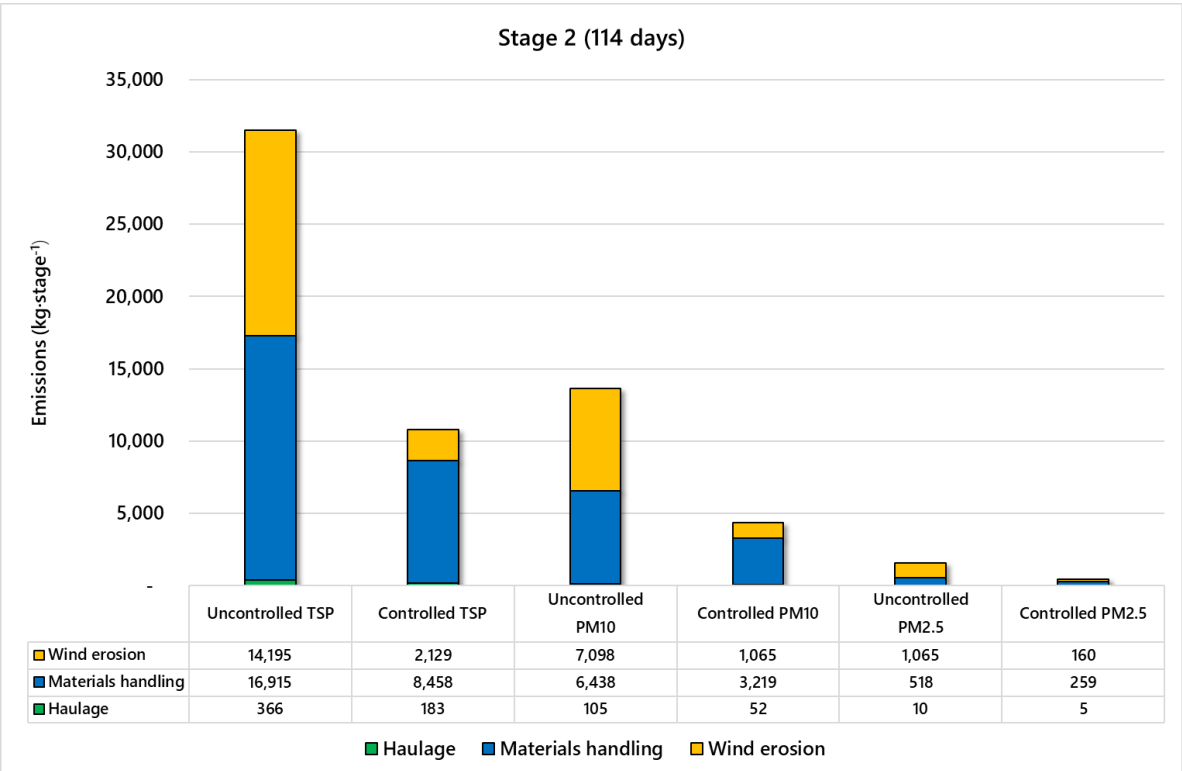
Stage	Reduction in emissions (%)		
	TSP	PM_{10}	$PM_{2.5}$
1	64	67	72
2	66	68	73
3	66	68	73
All (mean of Stages 1-3)	64	67	72

Figure 2 Particulate emissions, Stage 1 construction – uncontrolled and controlled



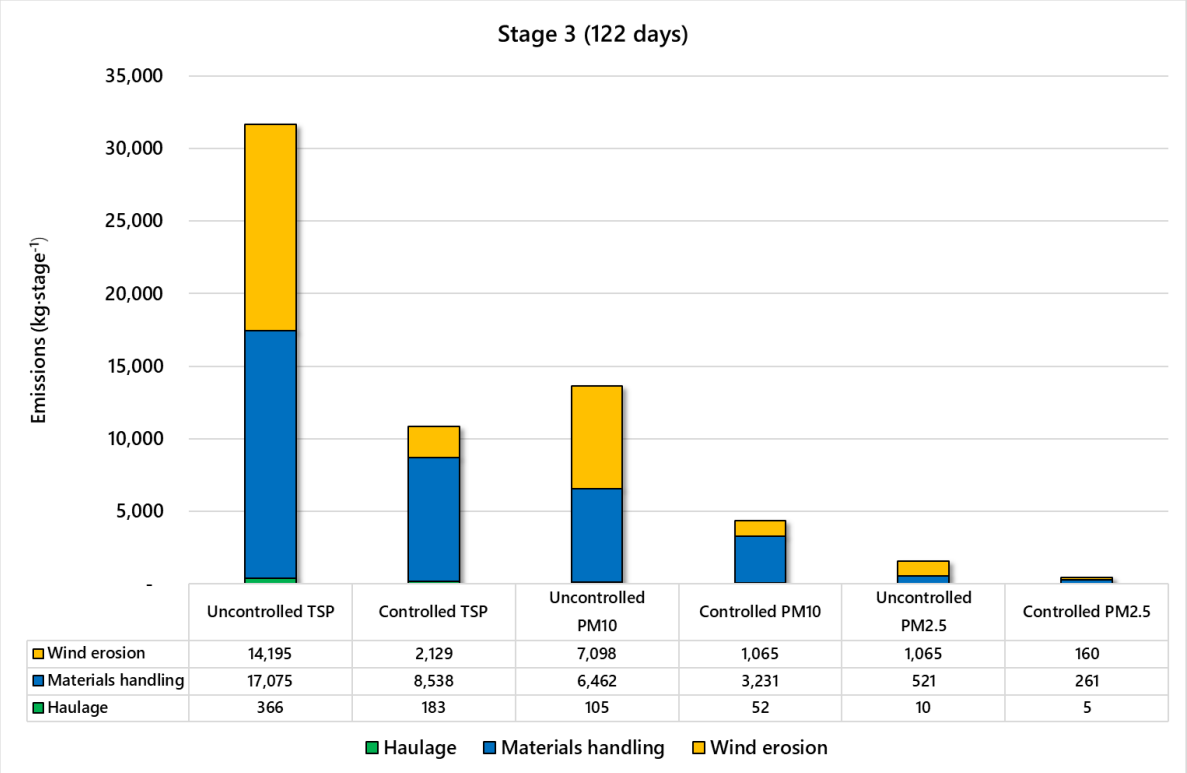
	Uncontrolled TSP	Controlled TSP	Uncontrolled PM10	Controlled PM10	Uncontrolled PM2.5	Controlled PM2.5
Wind erosion	50,324	7,549	25,162	3,774	3,774	566
Materials handling	58,603	29,302	22,620	11,310	1,804	902
Haulage	19,392	9,696	5,541	2,770	554	277

Figure 3 Particulate emissions, Stage 2 construction – uncontrolled and controlled



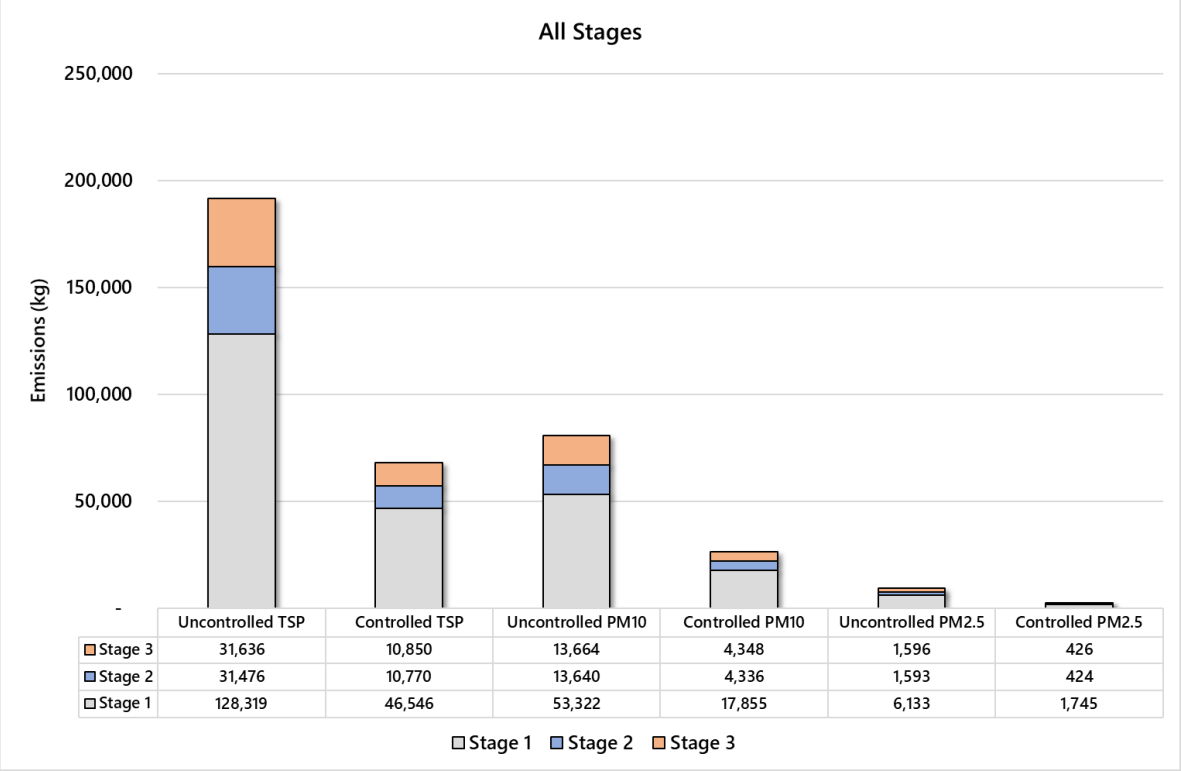
	Uncontrolled TSP	Controlled TSP	Uncontrolled PM10	Controlled PM10	Uncontrolled PM2.5	Controlled PM2.5
Wind erosion	14,195	2,129	7,098	1,065	1,065	160
Materials handling	16,915	8,458	6,438	3,219	518	259
Haulage	366	183	105	52	10	5

Figure 4 Particulate emissions, Stage 3 construction – uncontrolled and controlled



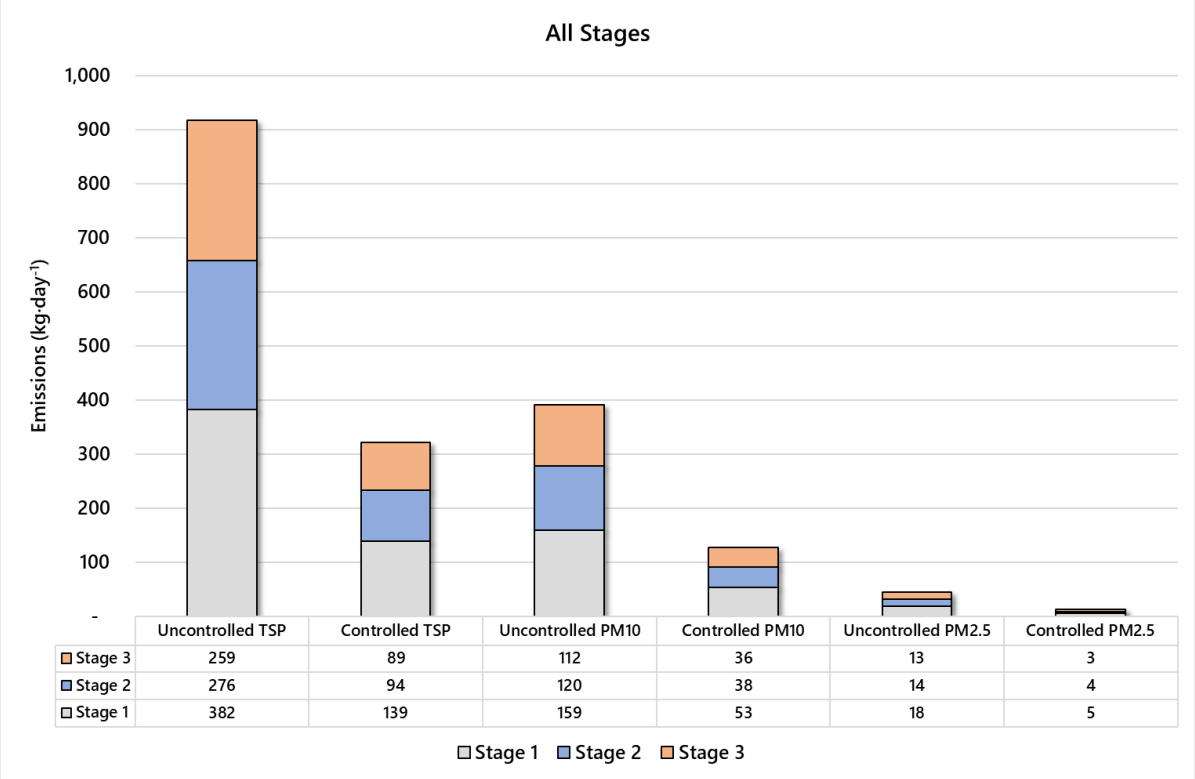
	Uncontrolled TSP	Controlled TSP	Uncontrolled PM10	Controlled PM10	Uncontrolled PM2.5	Controlled PM2.5
Wind erosion	14,195	2,129	7,098	1,065	1,065	160
Materials handling	17,075	8,538	6,462	3,231	521	261
Haulage	366	183	105	52	10	5

Figure 5 Particulate emissions, all stages – uncontrolled and controlled



	Uncontrolled TSP	Controlled TSP	Uncontrolled PM10	Controlled PM10	Uncontrolled PM2.5	Controlled PM2.5
Stage 3	31,636	10,850	13,664	4,348	1,596	426
Stage 2	31,476	10,770	13,640	4,336	1,593	424
Stage 1	128,319	46,546	53,322	17,855	6,133	1,745

Figure 6 Particulate emissions, all stages, per day – uncontrolled and controlled

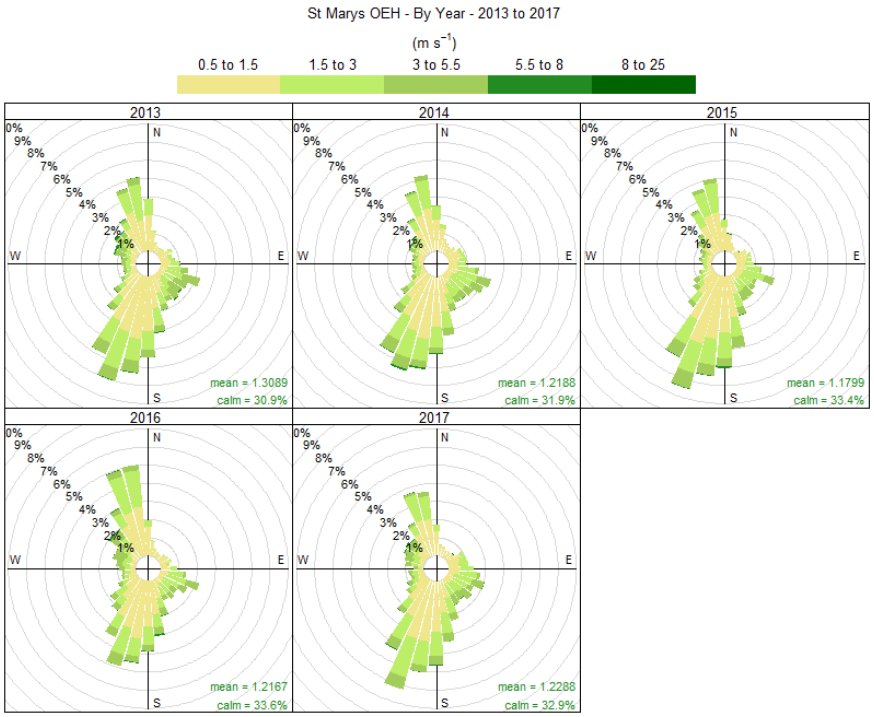


4. BASELINE DATA

4.1. Meteorology

The meteorology of the area surrounding the development site was characterised in the SSD Application through the use of observations collected at the NSW DPI&E air quality monitoring station (AQMS) located at St Marys, approximately 4 km from the development site. Wind roses showing the frequency of wind speed and direction from 2013 to 2017, as presented in the SSD Application are shown in **Figure 7**.

Figure 7 Annual wind roses 2013 to 2017, St Marys AQMS



The wind roses indicate that from 2013 to 2017, winds at St Marys AQMS show similar patterns across the years, with a predominant south-westerly wind direction.

The majority of wind speeds experienced at St Marys AQMS over the 5-year period, 2013 to 2017 are generally in the range <0.5 metres per second ($m \cdot s^{-1}$) to 5.5 $m \cdot s^{-1}$ with the highest wind speeds (greater than 8 $m \cdot s^{-1}$) occurring from a south westerly direction. Winds of this speed are not frequent, occurring <0.1 % of the observed hours over the 5-year period, at St Marys. Calm winds (<0.5 $m \cdot s^{-1}$) occur during 32.5 % of hours on average across the 5-year period.

4.2. Air Quality

The air quality of the area surrounding the development site was characterised in the SSD Application through the use of observations collected at the NSW DPI&E AQMS located at Prospect and Liverpool. Particulate matter (PM_{10} and $PM_{2.5}$) measurements collected during 2014 are presented in **Figure 8** and **Figure 9**. Data from the year 2014 were adopted in the SSD Application as these were considered to be representative of the longer-term period. These data indicate that, during 2014, concentrations of both PM_{10} and $PM_{2.5}$ were below the air quality criteria, although examination of data from more recent years indicates that concentrations can be elevated on occasion. These elevations have been shown to be generally related to the incidence of drought, dust storms and bushfires.

The aim of the CAQMP is to minimise the contribution of particulate matter resulting from the construction of the development.

Figure 8 PM_{10} measurements, Prospect 2014

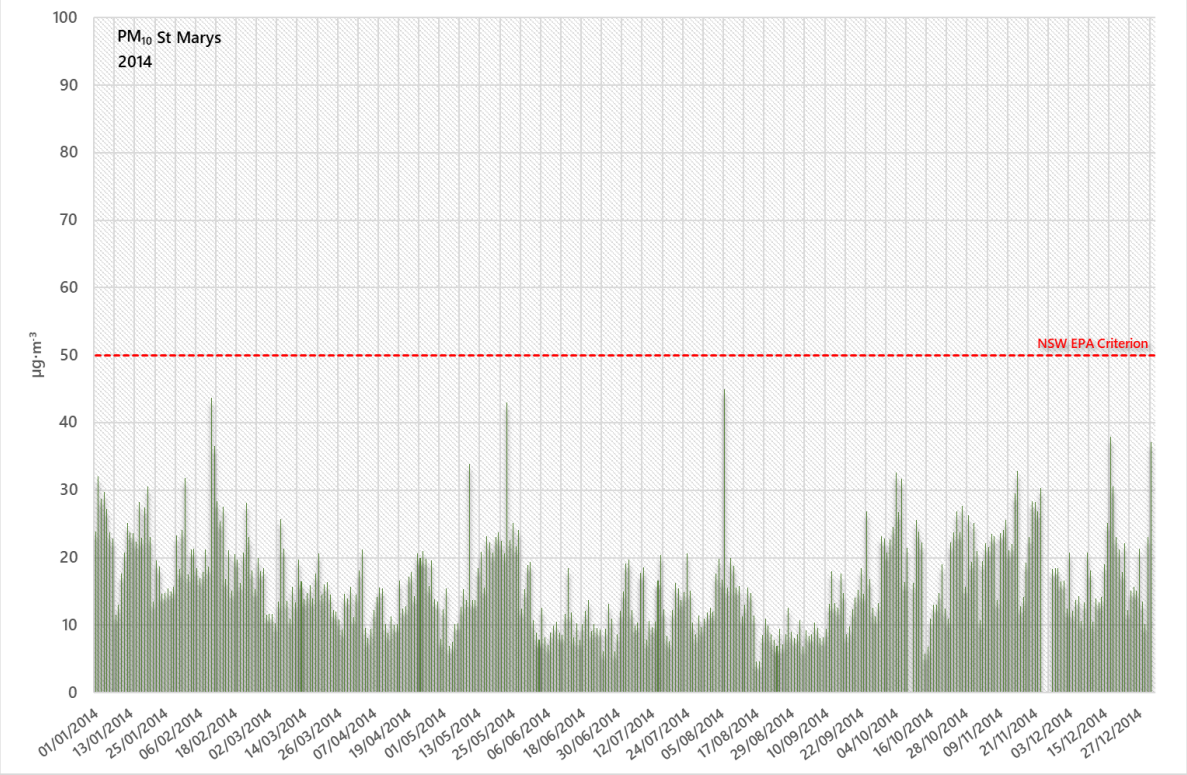
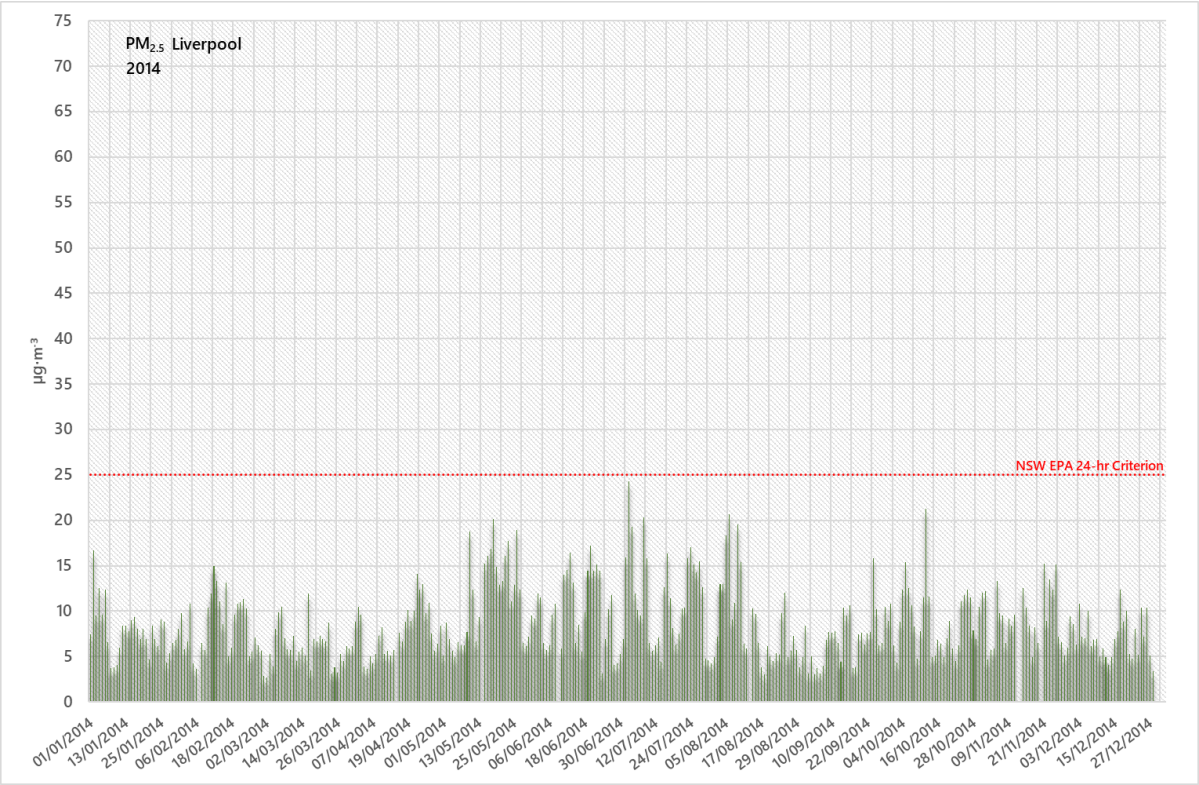


Figure 9 PM_{10} measurements, Prospect 2014



5. AIR QUALITY STANDARDS

The NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2017) lists the statutory methods that are to be used to model and assess emissions of criteria air pollutants from stationary sources in NSW and Section 7.1 of the Approved Methods clearly outlines the assessment criteria for the development.

The criteria listed in the Approved Methods are derived from a range of sources (including National Health and Medical Research Council (NHMRC), National Environment Protection Council (NEPC), Department of Environment (DoE), World Health Organisation (WHO), and Australian and New Zealand Environment and Conservation Council (ANZECC)).

Where relevant to this CAQMP, the criteria have been adopted as set out in Section 7.1 of NSW EPA (2017) which are presented in **Table 6** below.

Table 6 NSW EPA air quality standards and goals

Pollutant	Averaging period	Units[(d)]	Criterion
Particulates (as PM_{10})	24 hours	$\mu g \cdot m^{-3}$ [(a)]	50
	1 year	$\mu g \cdot m^{-3}$	25
Particulates (as $PM_{2.5}$)	24 hours	$\mu g \cdot m^{-3}$	25
	1 year	$\mu g \cdot m^{-3}$	8
Particulates (as TSP)	1 year	$\mu g \cdot m^{-3}$	90
Particulates (as dust deposition)	1-year[(b)]	$g \cdot m^{-2} \cdot month^{-1}$	2
	1-year[(c)]	$g \cdot m^{-2} \cdot month^{-1}$	4

Notes: **(a):** micrograms per cubic metre of air **(b):** Maximum increase in deposited dust level **(c):** Maximum total deposited dust level **(d)** Gas volumes are expressed at 25°C (298 K) and at an absolute pressure of 1 atmosphere (101.325 kPa)

6. AIR QUALITY MANAGEMENT

The air quality management measures to be adopted during the construction of the development have been determined through the quantification of emissions and the identification of major emissions sources as outlined in **Section 3.5**. Measures have also been identified through review of (NSW EPA, 2017) and (IAQM, 2014).

Key performance indicators (KPI) for the development are provided in **Section 6.1**. For the CAQMP as a whole, the following is provided, as required by the Project Approval Conditions:

- Monitoring method;
- Location, frequency and duration of monitoring;
- Record keeping;
- Complaints register;
- Response procedures; and,
- Compliance monitoring.

6.1. Key Performance Indicators

As previously outlined, the key objectives of the CAQMP are to prevent visible emissions of dust from the development site and to ensure that impacts to air quality are minimised and within the scope permitted by the Approval. To achieve these objectives, the summarised targets in **Table 1** have been proposed for the management of air quality impacts during construction.

Table 7 Key performance indicators (KPIs) associated with the management of air quality

Measure	Target	Timeframe	Responsibility	Documentation
Visible dust emissions	Any emissions of visible dust investigated immediately. Review controls applied and increase controls or modify activities	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Spillage or track-out onto public roads	Any spillage or track-out on public roads to be cleaned immediately	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist

Measure	Target	Timeframe	Responsibility	Documentation
Maintenance of all plant and equipment used on site in a proper and efficient condition Operation of all plant and equipment used on site in a proper and efficient manner	All plant and equipment to be maintained in accordance with manufacturers specifications All plant and equipment to be operated efficiently	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Complaints regarding air quality	Zero complaints. Any complaints would be investigated (see Section 7.2)	At all times	Site supervisor	Complaints register
Meeting Project Approval Conditions regarding air quality	Compliance with conditions	At all times	Site supervisor	Environmental inspection checklist Construction Compliance Report

Air quality impacts during construction are likely to be minor and manageable through the implementation of the control measures outlined in **Section 6.3**. The success of the CAQMP would, in part, be determined through compliance with the KPIs outlined above. To ensure that the development is operated in accordance with conditions of consent, dust deposition monitoring is proposed at four locations on the boundary of the development site, for the duration of works. A description of the proposed monitoring program is outlined in **Section 6.2**.

6.2. Air Quality Monitoring

The monitoring process is detailed below and will support the assessment of compliance for dust deposition against the criteria specified in **Section 5**. The process will consist of:

- Maintaining dust deposition monitoring devices at the development site in line with Australian / New Zealand Standard (AS) 3580.10.1:2016 and other relevant standards;
- Collect dust samples each 30±2 days in accordance with AS 3580.10.1:2016 and other relevant standards and provide the collected samples to a NATA accredited laboratory for analysis;
- Compile monitoring results over a 12-month sampling period and calculate the annual average dust deposition rate (as $g \cdot m^{-2} \cdot month^{-1}$) for each monitoring location;
- Review the number, frequency and nature of any environmental complaints received over the same 12-month period, as relates to dust amenity issues;

- Produce a dust monitoring report specifying the results of the monitoring and whether compliance has been achieved; and,
- If the monitoring results reveal an exceedance of the dust deposition criteria (in any month of monitoring), identify and apply further dust mitigation measures.

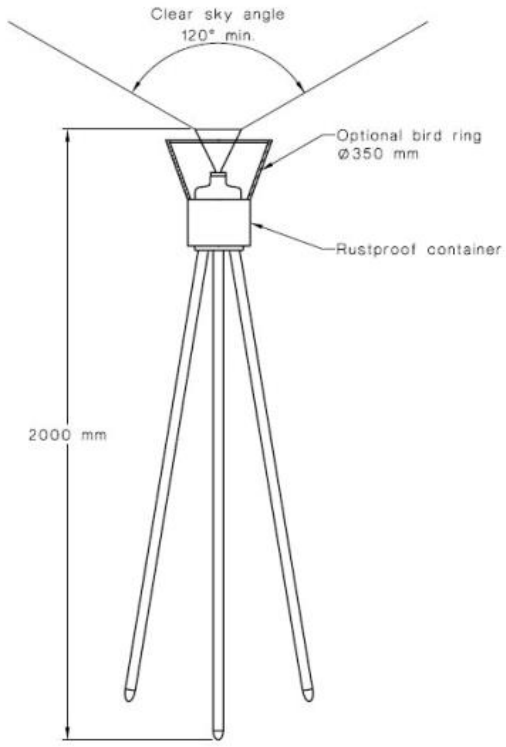
A review of the 12-month sampling period results will be undertaken by a suitably qualified and experienced professional.

Monitoring is proposed at four locations on the boundary of the development site. These locations will generally reflect the northern, southern, eastern and western boundaries, and specific locations will be selected prior to construction to ensure that they meet the requirements of the relevant AS.

Monitoring will be conducted using dust deposition gauges (DDG) constructed in accordance with AS 3580.1.10:2016. This apparatus involves the collection of passing dust with a funnel and bottle arrangement. The dust emissions settle into the funnel from the ambient air and are collected in the bottle with any rainwater. The sampled mass deposition rate is calculated from the mass of solids collected from the bottle. The dust is collected over a monthly (30 day ± 2 day) period, and the results are expressed as $g \cdot m^{-2} \cdot month^{-1}$.

A typical dust deposition gauge and stand is illustrated in **Figure 10**.

Figure 10 Dust Deposition Gauge with Stand



The monitoring locations will be sited in accordance with the requirements of 'AS/NZS 3580.1.1:2007 *Methods for sampling and analysis of ambient air - Guide to siting equipment*, and AS/NZS 3580.10.1:2016.

The monitoring of dust deposition will be performed, and quality controlled in accordance with AS/NZ 3580.10.1:2016.

For every monthly (30 day ± 2 day) monitoring period the concurrent collection of all four gauges is required. The samples will be collected in accordance with AS/NZS 3580.10.1:2016.

After the NATA accredited laboratory has issued the monthly analysis report, the data will be reviewed by the site environmental representative and recorded in a database, which will be subsequently used to evaluate performance against the criteria specified in **Section 5**.

Unless otherwise required, an annual monitoring report will be prepared by a suitably qualified and experienced professional, describing the methodology and comparing the dust deposition monitoring against the relevant criteria. The annual report can then identify whether further monitoring is required based on whether an exceedance of criteria has occurred.

Following an exceedance of the dust deposition criterion listed in **Section 5**, or a dust related incident that results in a complaint, within 24 hours the site environmental representative will notify NSW DPIE of the exceedance/incident. The likely causes of any exceedances will be reviewed, and additional mitigation measures to further reduce dust emissions from operations and activities on site will be investigated and implemented.

The DDG monitoring will provide details on whether the activities at the development site are being performed in accordance with development consent conditions. These measurements will be supplemented by visual inspections on a daily basis, and through the KPIs as outlined in **Table 7**.

6.3. Emission Control Measures

The emission controls measures to be employed at the development site during construction are outlined in **Table 8**.

Table 8 Air quality management measures adopted during development construction

ID	Control Measure	Source	Responsibility	Monitoring/audit/inspection
Identified through review of major emissions sources (Section 3.5)				
AQ1	Watercarts and handheld water sprays on site to control dust (see also AQ25, AQ30), especially on exposed surfaces and stockpiles	Section 3.5	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ2	Speed limits for vehicles on-site (see also AQ23)			
AQ3	Progressive stripping of site ahead of workface to limit the amount of exposed surface			
AQ4	Dust suppressant/hydromulching to areas where final level achieved			
AQ5	Sediment and erosion controls as per civil design (see also AQ17)			
AQ6	Street sweeping where required			
AQ7	Truck wash at exit			
Identified through review of (NSW EPA, 2017) and (IAQM, 2014)				
AQ8	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	(IAQM, 2014)	Site supervisor	Construction Compliance Report
AQ9	Display the head or regional office contact information.	(IAQM, 2014)	Site supervisor	Construction Compliance Report
AQ10	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	(IAQM, 2014)	Site supervisor	Environmental inspection checklist
AQ11	Make the complaints log available to the local authority when asked.	(IAQM, 2014)	Site supervisor	Construction Compliance Report
AQ12	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	(IAQM, 2014)	Site supervisor	Environmental inspection checklist

ID	Control Measure	Source	Responsibility	Monitoring/audit/inspection
AQ13	Undertake daily on-site and off-site inspections where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary.	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ14	Carry out regular site inspections to monitor compliance with the CAQMP / CEMP, record inspection results, and make an inspection log available to the local authority when asked.	(IAQM, 2014)	Site supervisor	Environmental inspection checklist
AQ15	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ16	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	(IAQM, 2014)	Site supervisor	Environmental inspection checklist
AQ17	Avoid site runoff of water or mud after treatment and cleaning.	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ18	Keep site fencing, barriers and scaffolding clean using wet methods.	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ19	Cover, seed or fence stockpiles to prevent wind erosion	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ20	Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable	(IAQM, 2014)	Site supervisor	Construction Compliance Report
AQ21	Ensure all vehicles switch off engines when stationary - no idling vehicles	(IAQM, 2014)	Site supervisor	Environmental inspection checklist

ID	Control Measure	Source	Responsibility	Monitoring/audit/inspection
				Site supervisor's daily checklist
AQ22	Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable	(IAQM, 2014)	Site supervisor	Construction Compliance Report
AQ23	Impose and signpost a maximum-speed-limit of 25 $km \cdot h^{-1}$ on surfaced and 15 $km \cdot h^{-1}$ on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ24	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems	(IAQM, 2014), (NSW EPA, 2017)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ25	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate	(IAQM, 2014), (NSW EPA, 2017)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ26	Use enclosed chutes and conveyors and covered skips	(IAQM, 2014), (NSW EPA, 2017)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ27	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ28	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist

ID	Control Measure	Source	Responsibility	Monitoring/audit/inspection
AQ29	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ30	Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	(IAQM, 2014), (NSW EPA, 2017)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ31	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ32	Ensure all vehicles entering and leaving the site with loads have their loads covered	(IAQM, 2014)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Other				
AQ33	Inspect all plant and equipment regularly to ensure that it is maintained in accordance with manufacturers specifications	-	Site supervisor	Environmental inspection checklist
AQ34	Inspect the operation of all plant and equipment to ensure that it is being operated in a proper and efficient manner	-	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist

6.4. Contingency Plan

As required by Conditon C1 (e) of the Consent, a contingency plan to manage any unpredicted impacts and their consequences is required to ensure that ongoing impacts reduce to levels below the impact assessment criteria as quickly as possible.

Section 3.5 of the CEMP outlines the incident and non-compliance response and handling procedure, with Section 5.4 of the CEMP outlining the contingency management plan.

6.5. Training

All personnel, including employees, contractors and sub-contractors, are required to complete a project induction containing relevant environmental information before they are authorised to work on the development.

Air quality specific information to be covered in the project induction will include:

- Obligations under the project Conditions of Approval (including the CAQMP), including the identification of potential sources of air pollutants of concern and the mitigation measures to be implemented, including measures (e.g. use of water, cover exposed areas) during weather conditions where high levels of dust are probable;
- Responsibilities relating to the management of air quality under the *Protection of the Environment Operations Act* 1997 and Protection of the Environment Operations (Clean Air) Regulation 2010;
- Typical construction activities that may impact air quality and associated environmental safeguards; and
- Incident response procedures.

A detailed description of the inductions and environmental training to be provided in outlined in Section 3.4 of the CEMP.

7. REVIEW AND IMPROVEMENT

A daily site inspection will be performed by the Site Supervisor, and will include relevant checks to ensure that the air quality management measures outlined in **Table 8** are achievable. Any identified remedial actions will be promptly addressed.

Monitoring of dust emissions will be performed through the daily site inspection and visible observations by the Site Supervisor. The dust control observations will be made during the morning and repeated as required to adequately account for changing conditions. A 'Daily Checklist' will be used to record each day's visible dust plume observations, noting any potential sources that may change due to changing conditions or require further observation.

If conditions change significantly on-site subsequent to the performance of the daily check, further '*ad-hoc*' checks will also be performed and documented in the same manner.

Training of staff and contractors will include dust management as outlined in **Section 6.4**.

Through observations made during the site check, or through notification by staff or contractors, the Site Supervisor will have the authorisation to review operations performed on-site and alter site activities and/or additional controls necessary to effectively manage those risks.

Key Performance Indicators for the operation of the Facility would be associated with the triggers in **Table 7**.

Revision of the AQMP would be performed as per Condition C8 of the consent (as relevant to air quality management):

Within three months of:

(a) the submission of a Compliance Report under condition C14;
(b) the submission of an incident report under condition C10;
(c) the approval of any modification of the conditions of consent; or,
(d) the issue of a direction of the Planning Secretary under condition A2(b) which requires a review.

The AQMP would be subject to review after the first three months of operation, and then after every 6 months to ensure applicability to development activities. This meets the requirement of Condition C1(h) of the Conditions of consent.

Section 3.5 of the CEMP outlines the incident and non-compliance response and handling procedure.

7.1. Non-Compliance, Corrective and Preventive Action

Environmental inspection and observation results are interpreted to identify actual and potential non-conformances and events that may result in nuisance, environmental harm and unacceptable loss of amenity or community complaints. The Environmental Representative and/or a public authority may also raise a non-compliance or improvement notice.

Where non-compliances are identified during regular inspections, corrective actions are raised, tracked and closed out through the inspection records.

Following the identification of a non-compliance, corrective and/or preventative actions will be identified and assigned to the appropriate person with set timeframes. Timeframes will be set to ensure any damage incurred is rectified and any chance of recurrence is eliminated as soon as practicable. An appropriate register will be used to assign, track and close out corrective actions.

7.2. Complaints Handling Procedure

A detailed description of the complaints handling procedure is outlined in Section 3.6 of the CEMP.

Frasers / Altis Property Partners will operate a telephone complaint line during the operating hours of the development site during construction, with the number publicly notified via the Frasers / Altis Property Partners website. All complaints must be investigated, and feedback will be provided to the petitioner or the pertinent agency in a timely manner.

For any complaint received relating to air quality impacts from the construction activities, the following measures will be taken:

- Site Supervisor to review and follow up all the complaints regarding dust within one business day of receiving the complaint;
- Fill out the appropriate complaint form, including location of complaint and noting the time and date of the complaint/s and the identity and contact details of the complainant (if agreed to provide them).
- Perform a site inspection, noting all dust producing activities taking place and the mitigation methods being used. If the complaint was related to an event in the recent past, if possible, note any dust or odour producing activities that were underway at that time and initiate any remedial action necessary.
- As soon as possible, visit the area from where the complaint originated to ascertain if the issue persists.
- It is important to verify if another source of dust other than the construction activities of the project is causing the complaint and collect appropriate evidence of this (photos and/or videos as appropriate).
- Once investigations have been completed, contact the complainant to explain any problems found and remedial actions taken.
- If necessary, update any relevant procedures to prevent any recurrence of problems and record any remedial action taken.

7.3. Record Keeping

The Site Supervisor will keep a record of any complaint made to the development site or any employee or any agent of the development in relation to air quality from the development site. A complaint register will be maintained and will be produced to any authorised officer of the EPA if requested. Records of individual complaints will include:

- Date and time of complaint.
- Method by which the complaint was made.
- Personal details of the complainant (if provided).
- Nature of the complaint.
- The details of an initial response to the complaint.
- Action taken and any follow up actions.
- If no action was taken, the reason why no action was taken.
- Weather conditions corresponding to the time of the complaint will also be noted in the logbook for assessment purposes.

8. REFERENCES

IAQM. (2014). *Guidance on the assessment of dust from demolition and construction.*

Northstar Air Quality. (2020). *Mamre Road South Precinct, 657 - 769 Mamre Road, Kemps Creek. State Significant Development - Air Quality Impact Assessment. Reference 18.1080.FR2V11. Dated 23 April 2020.*

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NSW EPA. (2016). *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.* NSW Environment Protection Authority.

NSW EPA. (2017). *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.* NSW Environment Protection Authority.

NSW EPA. (2017). *Local Government Air Quality Toolkit, Air quality guidance note, Construction sites.*

APPENDIX A

CV

Martin Doyle

Director

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qualifications

- PhD Air Quality Meteorology (University of East Anglia, UK, 2004)
- BSc (Hons) Environmental Science (University of East Anglia, UK, 1998)
- Certified Air Quality Professional (CAQP), Clean Air Society of Australia and New Zealand (CASANZ)

membership

- CASANZ NSW Branch Committee member 2007 - 2012
- CASANZ NSW Branch Training Activities Coordinator 2007 - 2012
- CASANZ Federal Deputy Chair Training Activities Executive 2008 – 2010

special expertise

Martin provides a range of expertise including:

- Air quality and greenhouse gas impact assessment
- Dispersion modelling studies including a range of specialist software
- Ambient air quality and meteorology studies
- Satellite remote sensing
- Geographical Information Systems (GIS)
- Indoor air quality and occupational exposure assessment
- Process & air pollution control due diligence and testing
- Odour impact assessment and audit
- Climate change impact assessment
- Expert testimony and witness
- Independent peer review and audit

background

Martin has almost 20 years of experience in the field of air quality, from academic research to public and private environmental consultancy. He completed his doctorate in 2004 in air pollution meteorology and was a Senior Research Associate at the University of East Anglia, which has the UK's highest rating for the quality of environmental research undertaken. His work has been included in UK Department of the Environment, Food and Rural Affairs Air Quality Expert Group state-of-science reports on PM_{10} and NO_2.

His major areas of expertise include air quality monitoring (including monitoring network design and data analysis), emissions inventory development, atmospheric dispersion modelling (using TAPM, CALPUFF, AUSPLUME, CALINE and AERMOD), greenhouse gas assessment and climate change impact assessment, independent peer review and performance of audits.

Martin has significant experience across all sectors (see overleaf) and broad experience in assessment of air pollutants including odour.

Use of Geographical Information Systems (GIS) and other software to present data to non-specialists in easy to understand formats is one of Martin's key interests.